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(71) Applicant(s)
Haxey Engineering Limited

(Incorporated in the United Kingdom)

High Street, Haxey, DONCASTER, DN9 2HH, United Kingdom

(72) Inventor(s)
Graham Westerman

(74) Agent and/or Address for Service
Urquhart-Dykes & Lord
8th Floor, Tower House, Merrion Way, LEEDS, LS2 8PA, United Kingdom

(54) A clamp

(57) A clamp (1) comprises first and second clamping means (2, 3) each of which comprises a first clamping portion (4) and a second clamping portion (5). Each jaw (4, 5) is mounted on a clamp arm (6a, 6b) which arms (6a, 6b) are connected to one another by means of a clamp arm guide shaft (7). The distance between the jaws (4, 5) may be varied by means of an adjusting wheel (8) moveable along a threaded screw (9) which causes movement of the clamp arm (6) along the shaft (7). Clamp arms (6a, 6b) are spaced apart from one another by means of clamp assembly guide shafts (10). The distance between clamping means (2, 3) may be varied by movement of the clamp arm (6a) relative to clamp arm (6b) along the shaft (10). The jaws can be rotated.

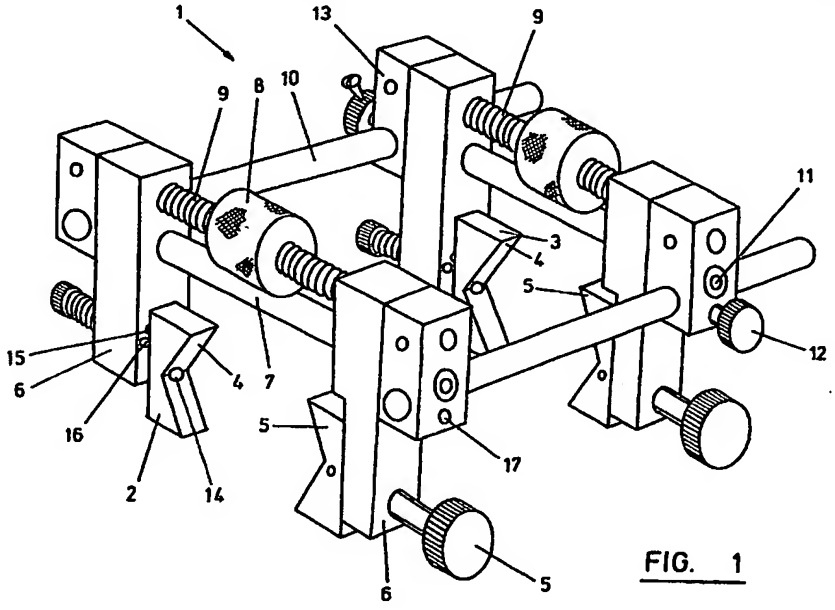

FIG. 1

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

This print takes account of replacement documents submitted after the date of filing to enable the application to comply with the formal requirements of the Patents Rules 1990.

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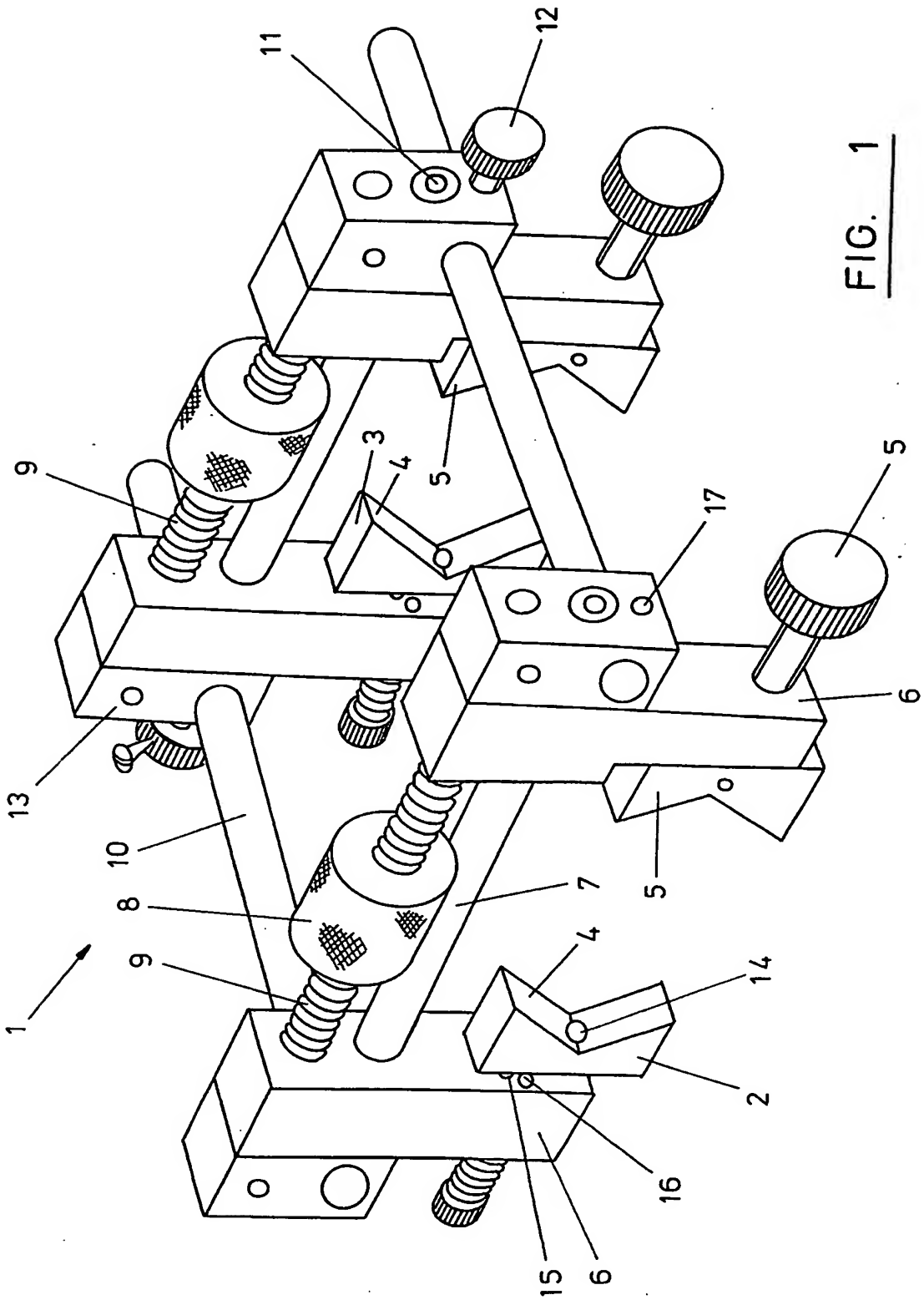


FIG. 1

FIG. 2

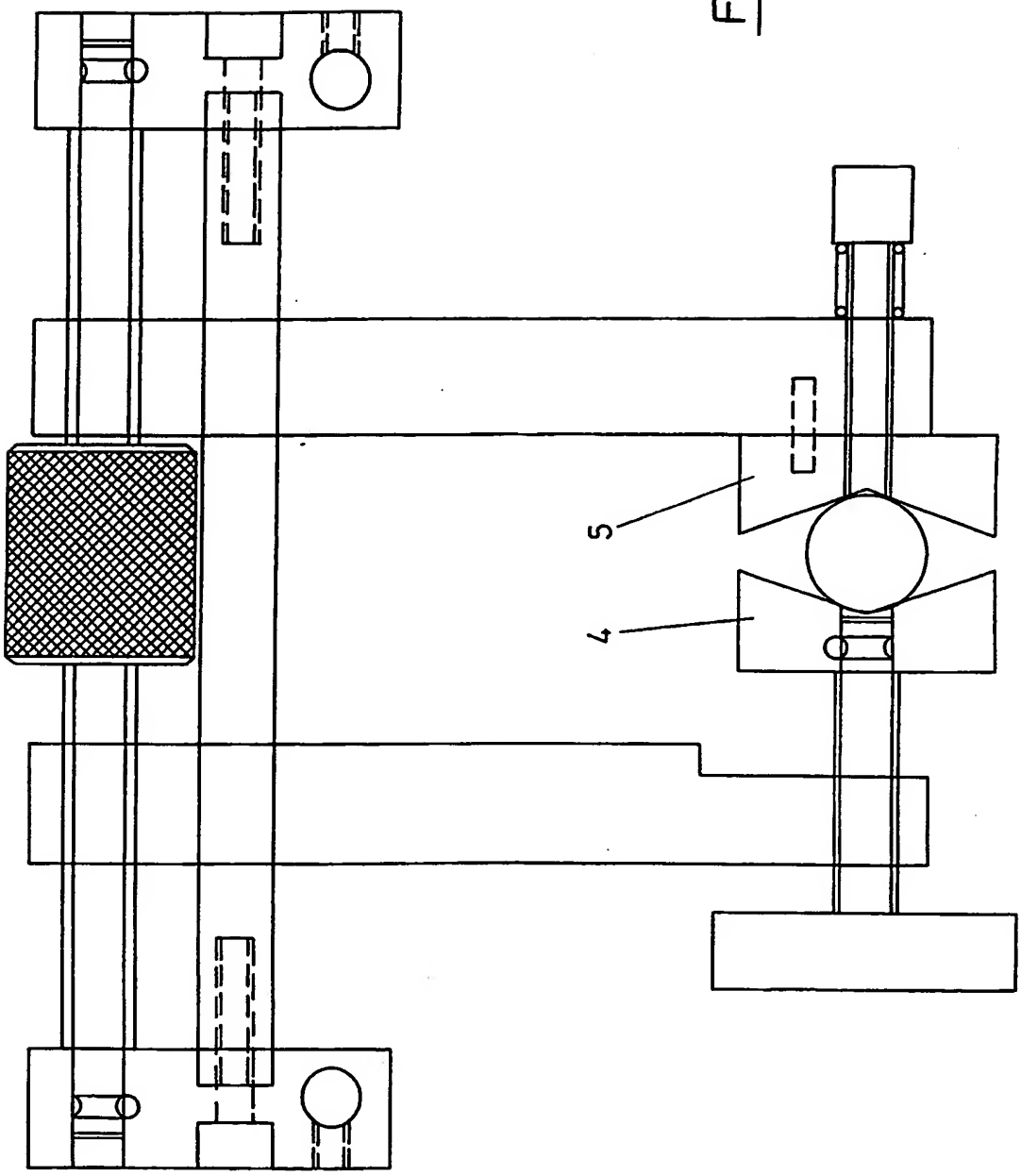
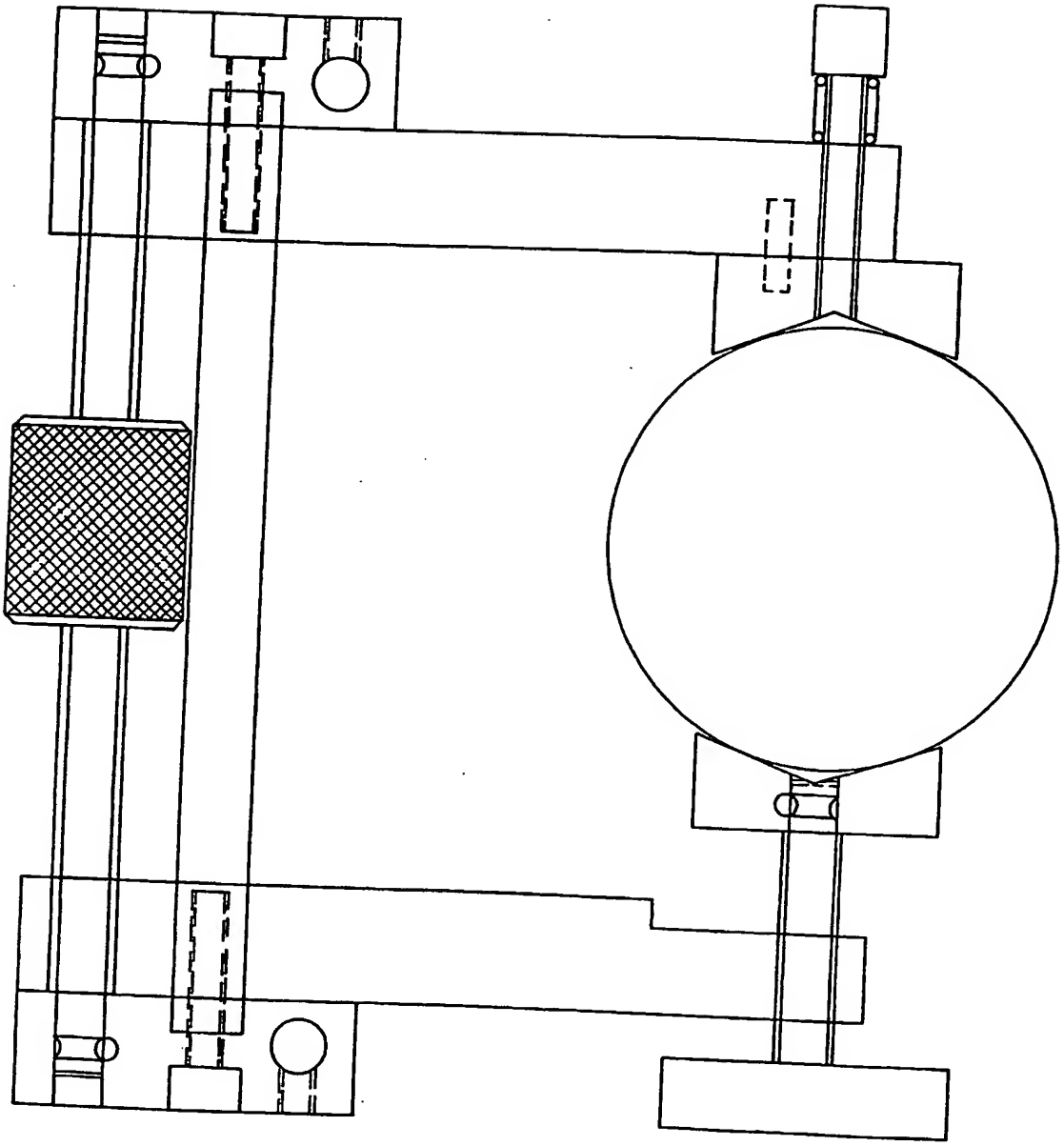


FIG. 3



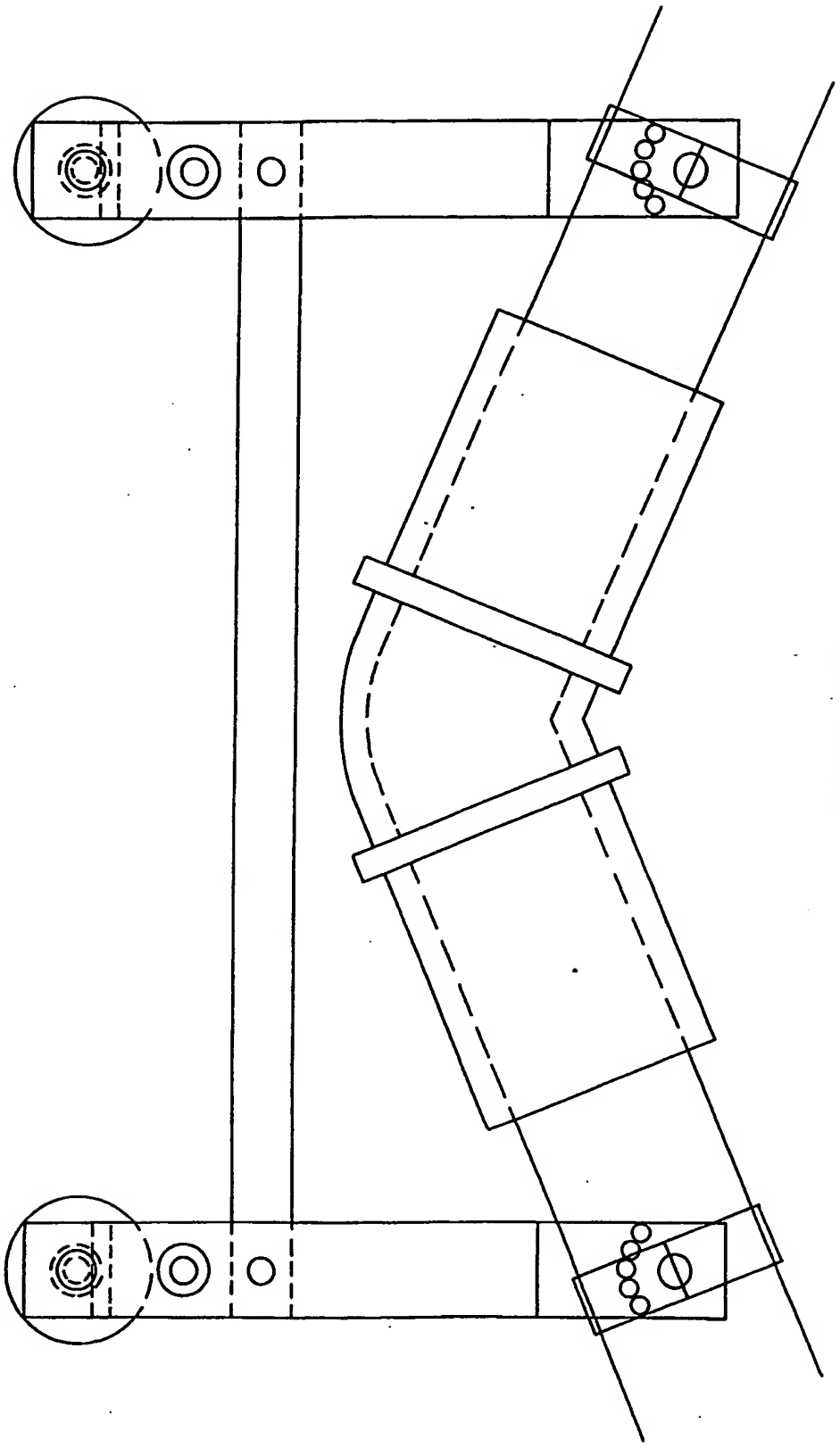


FIG. 4a

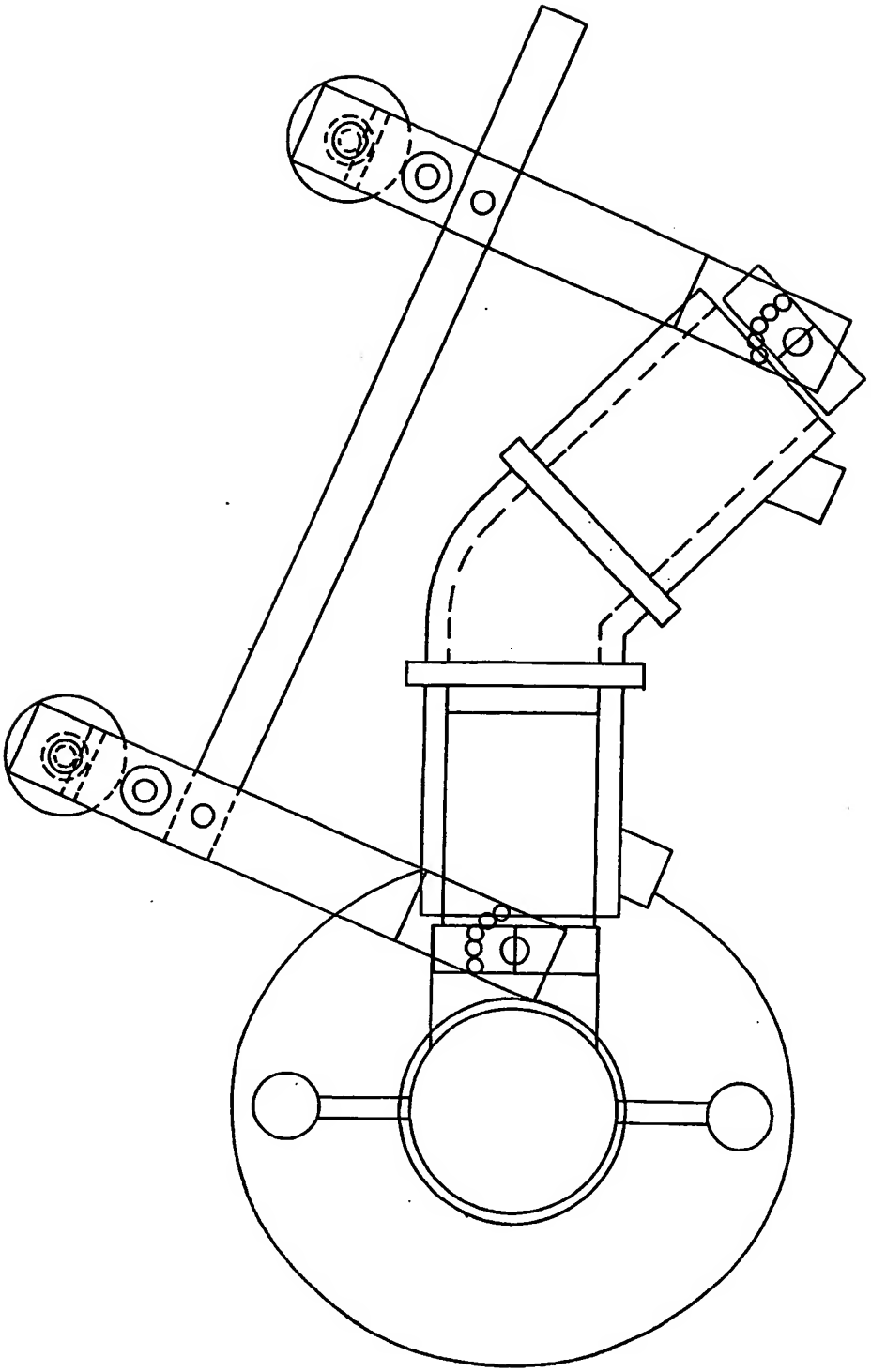


FIG. 4b

FIG. 5

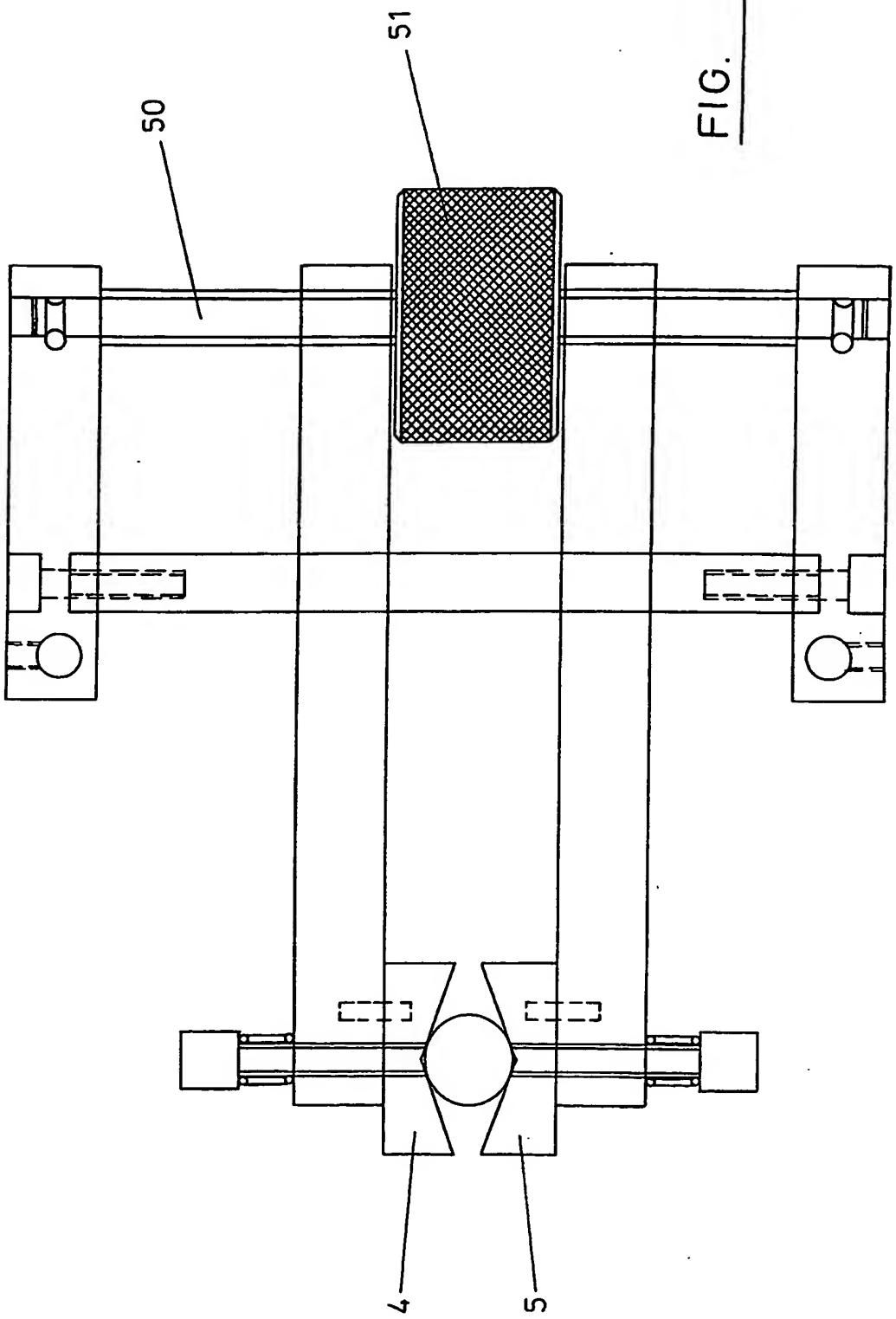
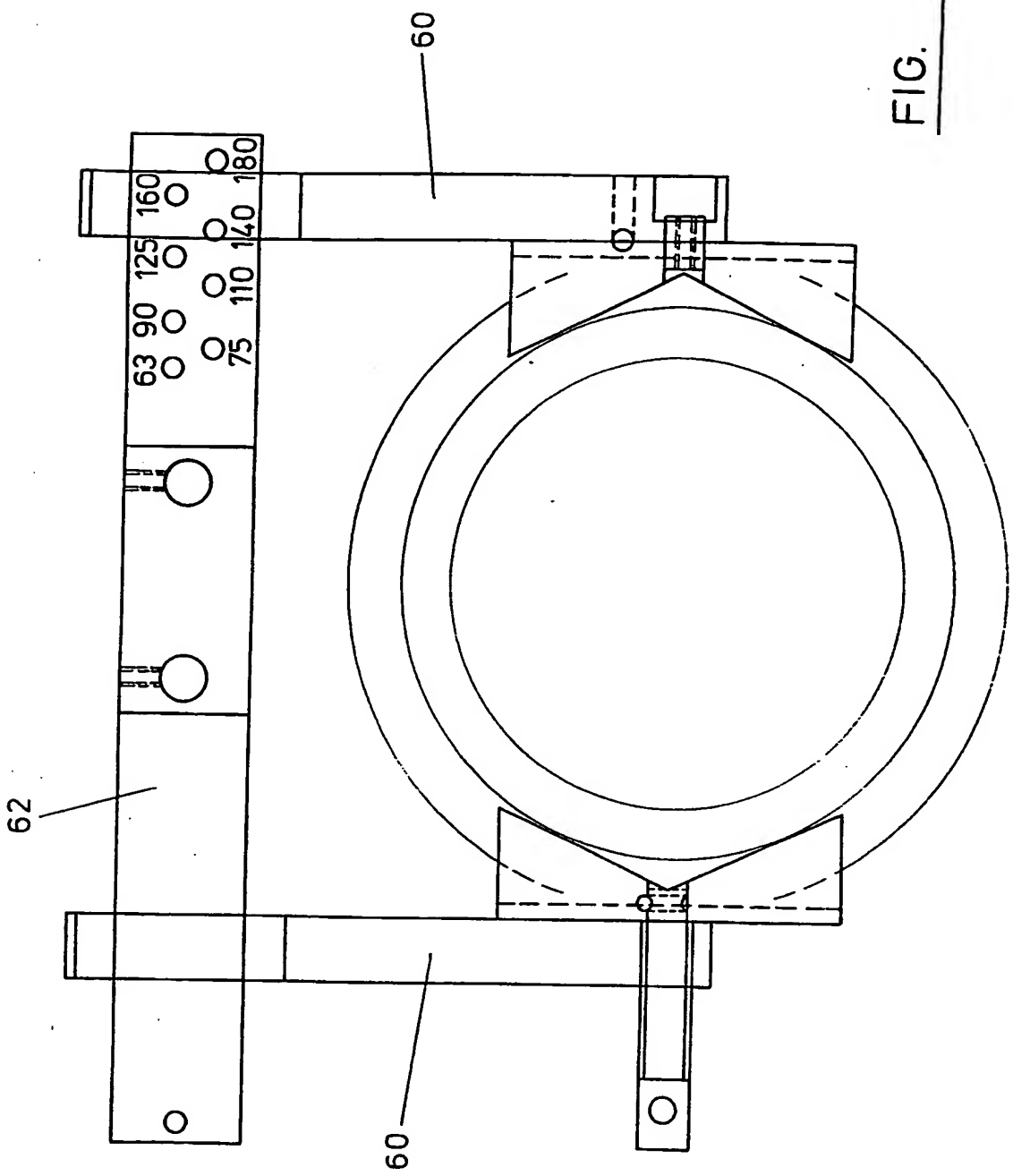


FIG. 6



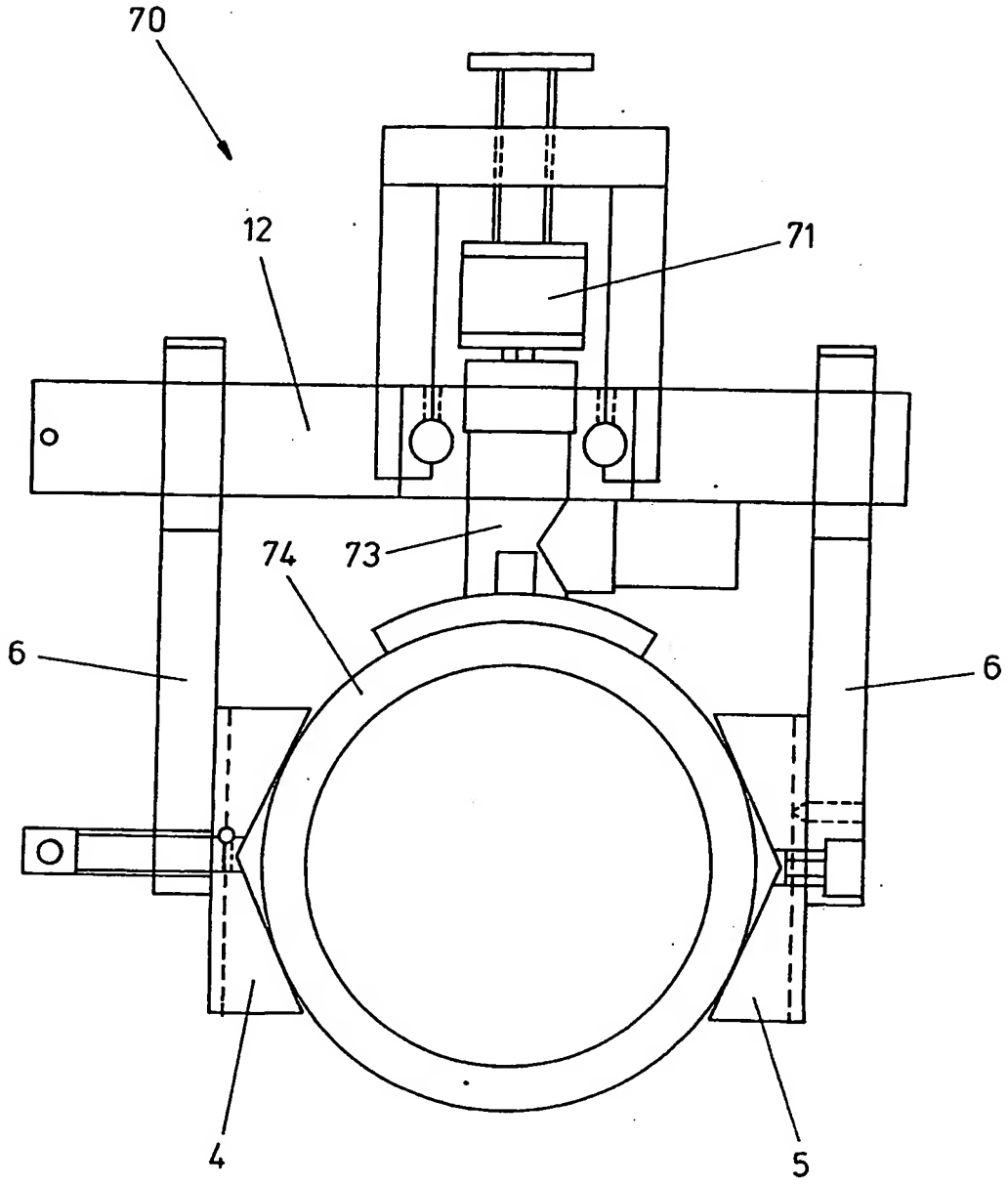


FIG. 7

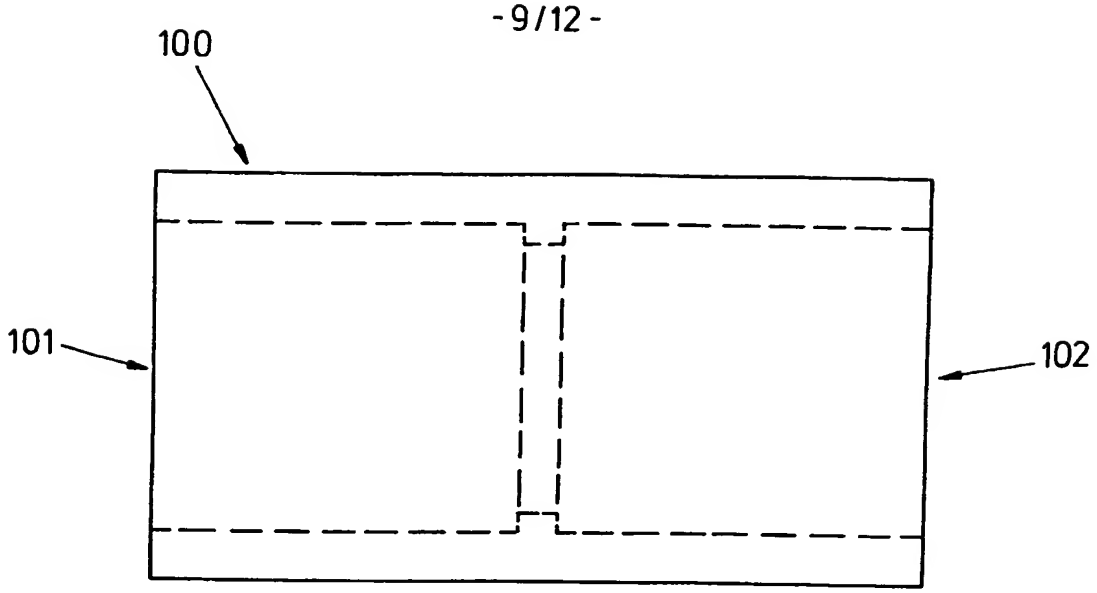


FIG. 8

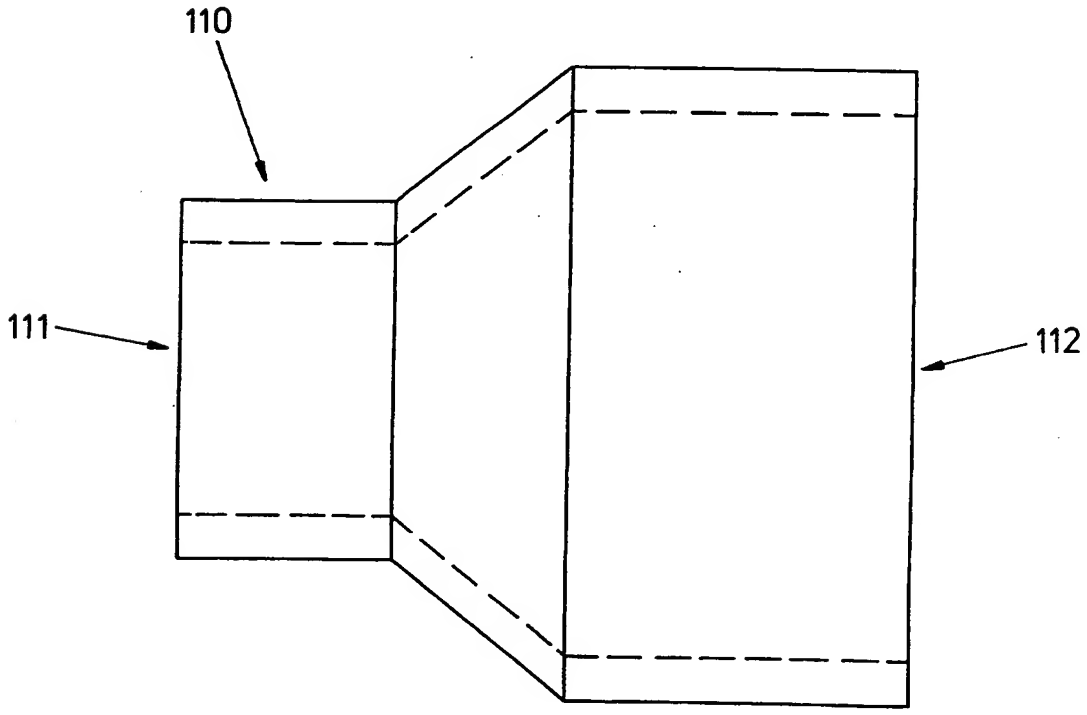


FIG. 9

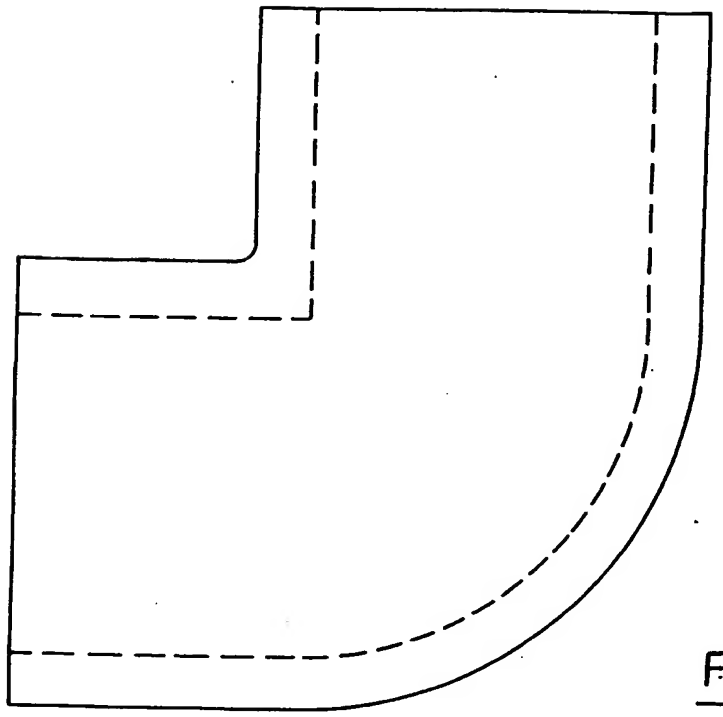


FIG. 10

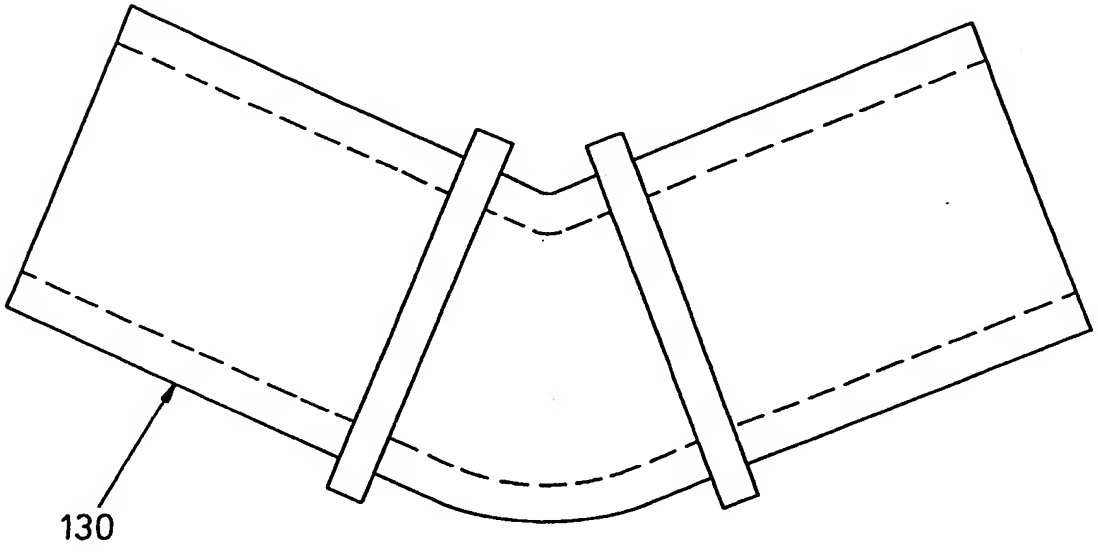


FIG. 11

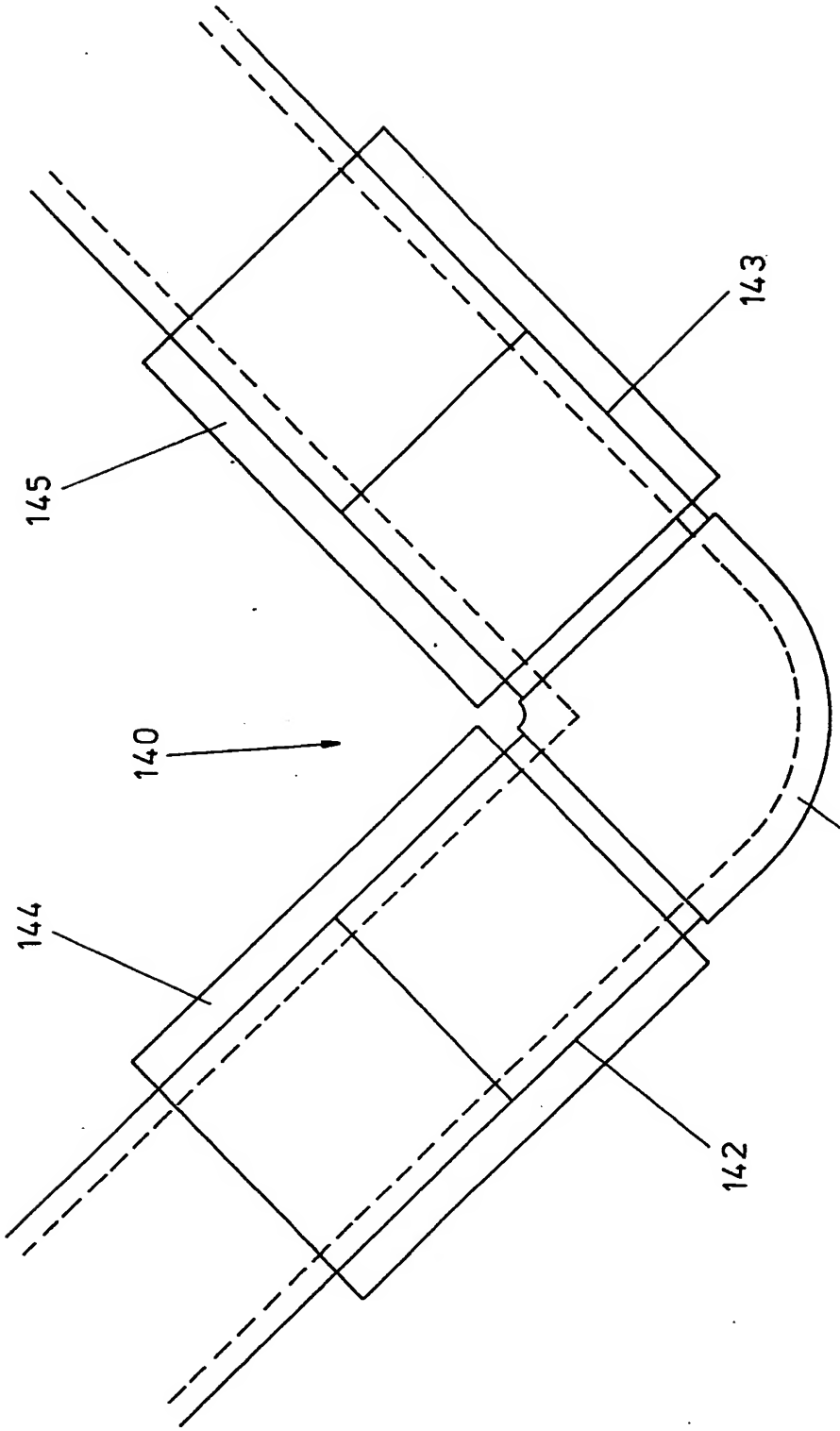


FIG. 12

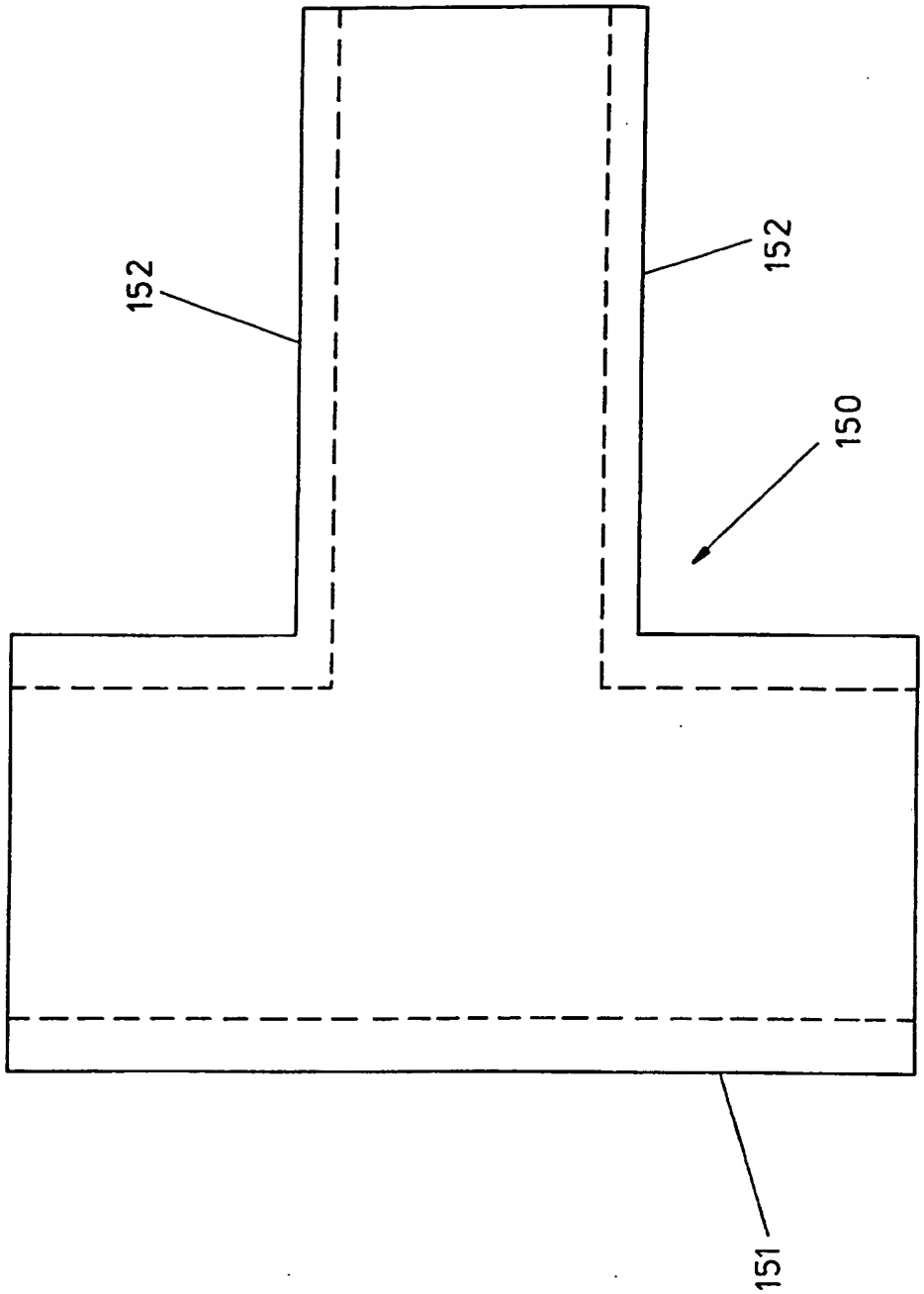


FIG. 13

A CLAMP

This invention relates to a clamp, and particularly, but not exclusively, to a clamp for clamping together two plastics pipes in order that the two pipes may be properly restrained whilst being joined together by means of electrofusion.

It is very well known to join together two plastics pipes by means of electrofusion. In order to form such joints, one or both of the ends of the pipes to be joined are inserted into a fitting that incorporates a coil of metal. In order to form the seal, the two pipes to be joined are held firmly together, within the pipe fitting, and an electric current is applied to the coil in the fitting which produces heat. The heat produced melts each pipe and the pipe fitting. The two pipes and pipe fitting then fuse together to form a joint.

A pipe fitting used to join two pipes may comprise a hollow tube in which a coil has been embedded. Such a tube is known as a coupler. A joint is formed by placing the two pipes to be joined in the coupler, one at either end and then applying a current to the coil.

A coupler may be substantially tee-shaped, in which case the coupler will have three ends. It is possible to place a pipe at any one or all of three ends of the tee-shaped coupler.

Alternatively, a pipe fitting may comprise a hollow coupler, and a spiggott extending from the coupler either from one or more ends of the coupler, or from another part of the coupler, for example to form a tee-shape. A spiggott is a length of tubing formed without a coil embedded in it, and to form a joint, a coupler is positioned over the spiggott. A coupler may then be positioned between the spiggott and the pipe and electrofusion may then be carried out to form the joint.

Typically, the pipes are used to carry gas or water between users premises and mains supply. It is necessary to form joins when joining for example a service pipe to a mains pipe.

In the case of both gas and water, it is vital the integrity of all joints between pipes is ensured, in order to avoid leakage of gas or water. A gas leak is potentially very dangerous in that it can result in explosion, and a water leak may result in untold damage to surrounding property and roads.

Pipes to be joined are joined in situ, and therefore the act of electrofusion typically occurs in a trench. Working conditions are therefore far from ideal.

Pipes which may require joining together may be of any size within a large range of sizes. In addition the pipes and pipe fitting are manufactured by a large number of manufacturers. Pipes to be joined therefore tend to be differently sized and the pipe fittings are often differently shaped.

It is known to clamp pipes together in restraining clamps after fitting the pipes into an appropriately shaped pipe fitting, before carrying out the act of electrofusion in order to ensure integrity of the seal. However, due to the large range of pipe sizes and shapes of fittings, it is often necessary to use a number of different clamps which are suitable for use with the large range of different types of pipes and pipe fittings which are available.

In addition, several different types of joints may be necessary. For example one joint is known as an in line joint which two pipes are joined together such that they are coaxial. A second type of joint is known as an elbow joint in which two pipes are joined together to form an angle which may be 90° or 45° or any other desirable angle. A third type of joint is known as an tee joint in which pipes are joined together to form a T shape.

In order to ensure clamps are available to suit all the different sizes of pipes and the different types of joints which may be required, it may be necessary to have a range of different clamps available in the trenches where the work is carried out. Clearly this can be very expensive, since it is necessary to buy so many different clamps. Typically at least two types of clamps are needed, one for in line joints and another for elbow joints.

Known clamps exists in which adaptors may be incorporated into a clamp in order to render the clamp suitable for use with a range of different size of pipes and types of pipe fittings. However, a problem with these known clamps is that the adaptors are detachable from the clamps, and are easily lost in the trenches where the work is carried out. This also is expensive as adaptors have to be frequently replaced.

According to the present invention there is provided a clamp comprising :

first clamping means having a first clamping portion and a second clamping portion which clamping portions are spaced apart from one another;

second clamping means having a first clamping portion and a second clamping portion, which clamping portions are spaced apart from one another, the second clamping means being spaced apart from the first clamping means.

first adjustment means for adjusting the distance between the first and second clamping portion of the first clamping means;

second adjustment means for adjusting the distance between the first and second clamping portions of the second clamping means and for limiting movement of the first and second clamping portions to one plane;

second adjustment means for adjusting the distance between the first and second clamping means and limiting the movement of the clamping means to one dimension.

third adjustment means for rotationally adjusting the first clamping means; and

fourth adjustment means for rotationally adjusting the second clamping means.

To ensure the integrity of a joint between two pipes, it is necessary to ensure that the pipes to be joined are substantially coaxial before the electrofusion occurs. By means of the present invention, such collinearity is ensured because movement of the first and second clamping means relative to one another is restricted to one dimension. This means that the first and second clamping means may be initially aligned and the alignment is preserved during subsequent adjustment of either the clamping means relative to one another or the respective clamping portions or both.

The clamp according to the present invention is capable of clamping pipes having any diameter within a wide range of diameters, because the distance between the respective pairs of clamping portions may be varied.

Due to the fact that the angle of the first and second clamping means may be varied, the clamp according to the present invention may be used to clamp together pipes and a pipe fitting to form an elbow joint.

Preferably, each of the first and second clamping means is mounted on a clamping arm. Each clamping means is rotatable about an axis of rotation relative to a respective clamping arm.

Preferably, the first clamping portion of each clamping means is indexably rotatable and the second clamping portion of each clamping means is freely rotatable. In use, each first clamping portion is positioned at a suitable angle by rotating the first clamping portion to a desired position. A pipe to be joined may then be placed within one of the clamping means in contact with the appropriately positioned first clamping portion, and the second clamping portion may be moved towards the pipe in order to tightly clamp the pipe. Because the second clamping portion is freely rotatable, once contact is made between the second clamping portion and the pipe to be clamped, the clamping portion will follow the angle set by the first clamping portion.

Advantageously each clamping portion comprises substantially V-shaped jaw. Because each jaw is V-shaped a wide range of pipes of different diameters may be accommodated within a single sized jaw.

Preferably, the clamp further comprises fixing means for fixing the clamping portions and/or clamping means in a desired position once the desired adjustments have been made.

Conveniently, the clamp further comprises attachment means attachable to the clamp at a point between the first and second clamping means which attachment means allow a third clamping means to be fitted to the clamp according to the present invention.

The additional clamping means which may be incorporated into the clamp may be useful if the pipes to be joined are large and the pipe fitting therefore heavy. In such a situation, the weight of the pipe fitting may cause the molten joint formed from the pipe fittings and the ends of the pipes to be joined, to sag during electrofusion due to the effect of gravity on the molten pipes.

It may sometimes be necessary to apply a so called tapping tee fitting to a pipe. A tapping tee fitting is used to tap into for example a mains pipe. In order to form a seal of high integrity between a tapping tee fitting and a pipe, it is necessary to apply a load to the fitting.

Conveniently, the clamp further comprises means attachable to the clamp at a point between the first clamping means and the second clamping means. The means may be used to apply a load to for example a tapping tee fitting.

The invention will now be further described by way of example only with reference to the accompanying drawings in which:

Figure 1 is a schematic representation of a clamp according to the present invention;

Figure 2 is a schematic part view of the clamp of Figure 1 in which the clamping means are holding a pipe in position;

Figure 3 is a schematic representation of a part view of the clamp in Figure 1 in which the clamping means are clamping a larger pipe in position;

Figures 4a and 4b is a schematic representation of a part view of the clamp in Figure 1 in which two pipes or one pipe and a spiggotted fitting may be held together to be joined at an elbow joint.

Figure 5 is a schematic representation of a part view of an alternative clamp according to the present invention in which a single adjusting wheel may be used to vary the distance between clamping portions and clamping means and also to tighten the clamping means;

Figure 6 is a schematic representation of a part of a further embodiment of a clamp according to the present invention in

which the clamping arms are indexed such that distance between them may be any one of a number of predetermined distances;

Figure 7 is a schematic representation of an adaptor which may be attached to the clamp at Figure 6 for applying a top load to a tapping tee fitting;

Figures 8 to 13 are schematic representations of different pipe fitting which may be used to form joints in plastics pipes.

Referring to Figure 1 a clamp according to the present invention is designated generally by the reference numeral 1. The clamp 1 comprises first and second clamping means 2,3 each comprises a first clamping portion 4 and a second clamping portion 5. Each clamping portion is in the form of a V-shaped jaw. Each jaw 4,5 is mounted on a clamp arm 6a, 6b which clamp arms 6a, 6b are connected to one another by means of a clamp arm guide shaft 7. The distance between the jaws, 4,5 may be varied by means of an adjusting wheel 8 moveable along a threaded screw 9 which causes movement of the clamp arm 6 along the shaft 7. Because the movement of the clamp arm 6 can only occur along the shaft 7, the movement is confined to one plane and relative position of the jaws 4,5 in a direction at right angles to the movement of the jaws remains substantially constant.

The adjusting wheel 8 in combination with the threaded screw 9 allows the distance between the jaws 4,5 to be varied as desired to suit the size of the pipe to be clamped before electrofusion is carried out. In addition, the movement is such that as the distance is varied, a point positioned substantially equidistant between the two jaws 4,5 remains substantially constant as the distance between the jaws is varied. This ensures that two pipes to be joined will be substantially collinear because the alignment between the first and second clamping means 2,3 is preserved.

Clamp arms 6a, 6b associated with respective clamping means 2,3 are spaced apart from one another by means of clamp assembly guide shafts 10. The distance between clamping means 2,3 may be varied by movement of clamp arms 6a relative to clamp arms 6b along the shafts 10. The shafts 10 ensure that movement is confined to one dimension only, and thus the clamping means 2,3 remain in alignment with one another. This also ensures collinearity of pipes to be joined. Once the clamping means 2,3 have been positioned at a suitable distance from one another, the position of the clamps means 2,3 may be fixed by tightening set screw 12. Shafts 9 are held in position within respective clamp arms 6a,6b by means of keeper pins 13. Shafts 10 are held in position by grub screw 17 and set screw 12.

Each jaw 4 of each clamping means 2,3 is rotatable about a pin 14 attachable to clamp arm 6. The rotation is indexed in that certain positions are predetermined. A pin 15 attached to jaw 4 is positionable within one of a plurality of apertures 16 which each define a predetermined position of the jaw. Each jaw 5 of respective clamping means 2,3 is freely rotatable about a pin attached to a respective clamp arm.

In use, when a pipe to be clamped is positioned within a pair of jaws 4,5, clamp screws 15 are used to move jaw 5 and jaw 4 towards each other. When the jaw 5 makes contact with the surface of a pipe to be clamped, the jaw 5 will assume the same angle as jaw 4 due to the fact that jaw 5 is able to freely rotate.

Because the jaws are able to rotate, it is possible to accommodate two pipes in an elbow joint within the clamp 1.

Referring to Figures 2 and 3, a part view of the clamp of Figure 1 is shown showing jaws 4,5 clamping pipes of various diameters.

Referring to Figure 4a and 4b the clamp of Figure 1 is shown with two pipes joined in an elbow joint in position, and also a tapping tee outlet.

Referring to Figure 5 a detail of an alternative clamp according to the present invention is shown in which both the distance between the jaws 4,5, and tightening of the jaws 4,5 when the pipe is in position may be affected by means of a screw thread 50 and adjusting wheel 51.

Referring to Figure 6 a further embodiment of the present invention is shown in which the distance between the clamping arms 60,61 is indexably variably in that a pin associated with arm 60 may be locatable in any one of a plurality of apertures positioned on beam 62. The beam 62 is preferably rectangular in cross-section.

Clamping arms 60, 61 each comprise a slot having substantially the same shape as the cross-sectional shape of the beam 62. The slots allow the arms, 60, 61 to slide along the beam 62 as they are shaped to receive the beam 62. The slots and apertures in the beam 62 are positioned to ensure appropriate co-linearity when two inline pipes are to be jointed.

Arm 60 will abut against a pin engaged in any aperture selected. Arm 61 will self lock when its clamping portion comes into contact with the pipe to be jointed, due to the geometry and sizing of its slot in relation to beam 62. As the clamping portion is clamped tighter, arm 61 grips ever tighter onto beam 62.

Clamp arm 60 grips onto beam 62 in the same way, and thus the engagement of a pin in an aperture allows for correct positioning only, whilst the clamping load is supported by beam 62 and thus there is no danger of clamp arm 60 slipping should the pin break or become lost or otherwise dislodged.

In some cases therefore it may be desirable that the clamp shown in Figure 6 may be used without the engagement of the pin into the apertures within beam 62. This may be desirable for clamping new pipe sizes or unknown international pipe sizes, as the clamp arms 60 and 61 can be set by sight using the apertures or by other means, to ensure co-linearity of an inline joint. For example, there is a well known and well established procedure to check for alignment of two inline pipes by rotating the electrofusion coupler to check for free radial movement. A well aligned joint allows free rotational movement. A tight fit caused by mis-alignment, results in no movement. In such a situation the operator must reassemble the joint and clamps.

Referring to Figure 7, a top loading adaptor is designated generally by the reference numeral 70. The top loading adaptor may be attached to shafts 10 such that the adaptor is positioned between the first and second clamping means 2,3. The top loading adaptor comprises a load cell 71 and a support bar 72. The adaptor 70 may be used to apply a top load to a tapping tee fitting 73. A tapping tee fitting is used to gain access to for example a mains pipe 74. In order to gain access to the pipe it is necessary to form a joint between the tapping tee fitting 73 and the pipe 74 by means of electrofusion. In order to ensure the integrity of the joints, it is necessary to apply a load to the tapping tee fitting 73. Once the joint has been formed, access may be gained to the mains pipe 74 by cutting through the wall of the pipe 74 at the tapping tee fitting. The pipe 74 is held in position by jaws 4 and 5.

Other types of adaptors may be attached to the clamp.

Figures 8 to 13 illustrate different types of pipe fittings which may be used to form a joint.

Figure 8 illustrates a straight electrofusion coupler 100 comprising a hollow tube in which a coil has been embedded. A

first pipe is inserted in end 101 and the second pipe is inserted in end 102, and heat applied to the coil in order to effect the electrofusion.

Figure 9 is a schematic representation of an electrofusion reducer in which the coupler 110 which has been formed with a coil embedded within it is capable of receiving a small diameter pipe at end 111 and a larger diameter pipe at end 112. Figure 10 illustrates a 90° electrofusion elbow in which two pipes may be joined at 90°. Figure 11 illustrates a 45° electrofusion elbow 130 in which two pipes may be joined at an angle of 45°.

Figure 12 illustrates a spiggotted elbow joint comprising a 90° elbow coupler 141 and shows spiggotts 142 and 143. The joint 140 further comprises straight couplers 144 and 145 in which pipes to be joined may be positioned.

Figure 13 illustrates an equal tee fitting 150 comprising a coupler 151 and a spiggott 152. In order to form a joint, a straight coupler will be positioned over spiggott 152, and a pipe will be positioned within a straight coupler.

It is to be understood that the term coupler is used herein before above to refer to a hollow tube formed from a plastics material, in which a coil has been embedded within the wall of a coupler.

A spiggott is used to define a hollow plastics tube in which no coil is present.

The present invention as explained particularly with reference to the several embodiments of the invention allows a single clamp device to be used for a very wide range of pipe sizes and types of electrofusion joints, for example, straight inline, bends etc and obviates the need for numerous clamps or adaptors.

Further, by means of the present invention, it is possible to restrain a pipe onto a tapping tee or similar fitting in situations where it may not be possible to do so with existing devices which require the attachment of clamps onto a spiggott outlet.

Embodiments of the present invention may comprise indexable jaws which may be indexed from zero to 90° in either direction. This means that the geometry between the clamp arm and the indexing pin is such that a position beyond 90° position from zero setting (ie 180°) the normally fixed jaw in each clamp arm is free to be set at any angle. This makes it possible to clamp onto a pipe and tapping tee fitting where the pipe and fitting body are at 90° to one another. This may be useful in situations where it is not possible to clamp onto the tapping tee spiggott outlet which is inline with the pipe.

CLAIMS

1. A clamp comprising:
first clamping means having a first clamping portion and a second clamping portion which clamping portions are spaced apart from one another;

second clamping means having a first clamping portion and a second clamping portion, which clamping portions are spaced apart from one another, the second clamping means being spaced apart from the first clamping means.

first adjustment means for adjusting the distance between the first and second clamping portion of the first clamping means;

second adjustment means for adjusting the distance between the first and second clamping portions of the second clamping means and for limiting movement of the first and second clamping portions to one plane;

second adjustment means for adjusting the distance between the first and second clamping means and limiting the movement of the clamping means to one dimension.

third adjustment means for rotationally adjusting the first clamping means; and

fourth adjustment means for rotationally adjusting the second clamping means.

2. A clamp according to claim 1 wherein each of the first and second clamping means is mounted on a clamping arm.

3. A clamp according to claim 2 wherein each clamping means is rotatable about an axis of rotation relative to a respective clamping arm.

4. A clamp according to any one of the preceding claims wherein the first clamping portion of each clamping means is indexably rotatable and the second clamping portion of each clamping means is freely rotatable.

5. A clamp according to any one of the preceding claims wherein each clamping portion comprises a substantially V-shaped jaw.

6. A clamp according to any one of the preceding claims further comprising fixing means for fixing the clamping portions and/or clamping means in a desired position once the desired adjustments have been made.

7. A clamp according to any one of the preceding claims further comprising attachment means attachable to the clamp at a point between the first and second clamping means, which attachment means allow a third clamping means to be fitted to the clamp.

8. A clamp according to any one of the preceding claims further comprising means attachable to the clamp at a point between the first clamping means and the second clamping means.

9. A clamp substantially as hereinbefore described with reference to the accompanying drawings.

Patents Act 1977
Examiner's report to the Comptroller under Section 17
(The Search report)

15

Application number
GB 9420491.4

Relevant Technical Fields

(i) UK Cl (Ed.N) E2A (AGB, AGC)

(ii) Int Cl (Ed.6) F16B 2/12; B23K 37/04, 35/053

Search Examiner
P J SILVIE

Date of completion of Search
9 JANUARY 1995

Databases (see below)
(i) UK Patent Office collections of GB, EP, WO and US patent specifications.

(ii) ONLINE: WPI

Documents considered relevant following a search in respect of Claims :-
ALL

Categories of documents

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A: Document indicating technological background and/or state of the art.

P: Document published on or after the declared priority date but before the filing date of the present application.

E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.

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Category	Identity of document and relevant passages		Relevant to claim(s)
X	GB 2042056 A	(PITTAS) whole document	1-3, 5-8
X	GB 1480167 A	(JAQUET) whole document	1-3, 5-8

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